

Coal Combustion Product Type

Fly ash

Project Name

Quay Quarter Tower

Project Location

Sydney, Australia

Project Participants

BG&E, Multiplex Construction, Boral Limited, De Martin & Gasparini

Project Completion Date

2021

Project Summary

Quay Quarter Tower, located in the Central Business District of Sydney, Australia, is an iconic skyscraper that offers some of the best views in the city. Built in 1976 at an original height of 623 feet, the building was deemed to have reached the end of its usable lifespan and, in 2018, underwent a three-year redevelopment that transformed the 46-story tower into a 709-foot, 54-floor high rise—all without demolishing the original structure. The tower is considered the world’s tallest adaptive reuse project and serves as a model for how to reconstruct an existing building while saving natural resources.

Project Description

For Quay Quarter Tower’s reconstruction, the project team set out to reuse as much of the existing building as possible. Instead of tearing it down and starting over, builders adopted an innovative rebuild technique that involved a top-down demolition of 30 percent of each floor and a simultaneous bottom-up construction of a composite steel-concrete jump-start structure.

To help cut carbon emissions during the reconstruction, structural engineers BG&E incorporated fly ash in wall,

column, and slab concrete elements. The fly ash, supplied by Boral Limited and sourced from the Eraring Power Station and Mount Piper Power Station, replaced approximately 20 percent of the portland cement in the mix.

Engineers further combined ground granulated blast furnace slag with fly ash in the mix to achieve an overall 40 percent reduction in the requirement for portland cement. In addition to reducing the carbon footprint associated with the manufacture of portland cement, specifying “ternary” mixes for concrete elements can often produce a material with improved performance characteristics, such as higher compressive strength and reduced permeability.

Project developers ultimately retained over 65 percent of the structure’s original beams, columns, and slabs, along with 95 percent of the original core. The new structure features concrete-filled tube columns, steel/concrete composite slabs, and 23,000 cubic meters of new concrete, while retaining the same amount of concrete from the original design. The reuse technique saved 12,000 tons of embodied carbon and set a global standard for extending the lifetime of tall concrete buildings. With a new service life projected to 2070, Quay Quarter Tower is considered a model of sustainable development.

The results have drawn international acclaim. In 2023 Quay Quarter Tower received multiple awards, including “Best Tall Building Worldwide” by the Council on Tall Buildings and Urban Habitat. It also earned the award for overall excellence at the American Concrete Institute’s 2023 convention and received the Kevin Cavanagh Medal from the Concrete Institute of Australia. Today, Quay Quarter Tower is recognized as the world’s tallest upcycled skyscraper.



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